

Chilling Engineers

Theme and Level

Theme: Research Options

Levels: Looking Deeper

At a Glance

Students design and construct a cooling system and identify occupations that use the skills involved in the activity.

Time: 100 minutes (across two days).

Essential Questions

- Which careers require advanced levels of design and math?
- Which careers require applied science?
- Which careers require practical applications of science?

Preparation

- Reserve computer lab with overhead projector enabled
- Ensure lab has sufficient open space for activity
- Establish CIS portfolios before this lesson
- Review lesson plan for Day One
- Organize the following materials for Day One:
 - Blocks of ice
 - Styrofoam
 - Cardboard
 - Newspapers
 - Packing tape and glue
 - Scissors
 - Plastic trash bags
 - Packing materials
 - Aluminum foil
 - Rulers
 - Ice cream and cones

Steps

Day 1

1. Show PowerPoint (PPT) Slide 1. Tell students that the goal of this lesson is for them to learn more about cooling systems and careers that use cooling technology skills.
2. Divide the class into teams of four.
3. Tell teams that their goal is to create a cooling container that best cools a block of ice, measured by whichever team's block of ice lasts the longest.
4. Distribute the materials. Encourage students to research online and use other classroom materials and resources to design their cooler.
5. Tell students that they must complete their design and construction during this class period using only the materials available in the classroom or school.
6. Tell students that this is a competition, and the group whose ice block lasts the longest will win ice cream cones in a subsequent class.
7. Provide remainder of class time for cooler design and construction.

Day 2

1. Offer ice cream cones to winning team.
2. Show PPT Slide 2. Ask the class to identify the reasons why the winning cooler worked most effectively.

3. Show PPT Slide 3. Ask students to identify which of these skills they used when designing and constructing their coolers.
4. Go to CIS. Demonstrate the skills selection and rating process used within the SKILLS assessment.
5. Ask students to log into CIS using their portfolio usernames and passwords.
6. Instruct students to go to SKILLS and then select the skills they and their group members used while designing and constructing their coolers.
7. Tell them to click on Get My Results and view the *Top 30 Occupations on their list.
8. Ask students if heating and cooling careers surfaced on any of these lists.
9. Ask students if any occupations of interest surfaced on their lists.
10. Tell students to save their thoughts about SKILLS and any occupations of interest in their portfolios by clicking the Save button.
11. Show PPT Slide 4. Discuss the links between classroom skills and occupation skills.

Variations and Accommodations

- Invite guest speakers from various heating and cooling companies to the class to talk about their careers and the preparation they undertook to secure their present position.
- Plan for class to visit a heating and cooling company worksite, and arrange for various workers to discuss their occupations and the preparation required for these.
- Work one-on-one with any student needing special assistance or pair student with a helpful group member for the activity.

Assessment

Use the *Chilling Engineers Scoring Guide* to evaluate student work.

Portfolio

Students enter their reflections about this activity in the **What occupations interest you now?** text box in the Research Options section of Career Plan.

Materials

Computer lab with a projector and CIS access

[Chilling Engineers \(PPTX\)](#)

[Chilling Engineers Scoring Guide \(PDF\)](#)

[Chilling Engineers Scoring Guide \(DOCX\)](#)

Blocks of ice

Styrofoam

Cardboard

Newspapers

Packing tape and glue

Scissors

Plastic trash bags

Packing materials

Aluminum foil

Rulers

Ice cream and cones

Materials shown on the left in blue are available by logging into a MCIS Administrative or Staff Account

Goals and Standards

Common Core State Standards

- English and Language Arts Career Anchor: Reading Informational Text
- English and Language Arts Career Anchor: Speaking & Listening
- Mathematical Practice: Make Sense of Problems and Persevere in Solving Them
- Mathematical Practice: Reason Abstractly and Quantitatively
- Mathematical Practice: Use Appropriate Tools Strategically
- Mathematical Practice: Attend to Precision

National Career Development Guidelines

- GOAL ED2 Participate in ongoing, lifelong learning experiences to enhance your ability to function effectively in a diverse and changing economy.
- GOAL CM2 Use a process of decision-making as one component of career development.

American School Counselor Association

- Career Development, Academic Development

Bloom's Taxonomy: Understanding, Applying, Analyzing, Synthesizing

American School Counselor Association (ASCA) Mindsets and Behaviors for Student Success

Mindset Standards

- Belief in Development of Whole Self, Including a Healthy Balance of Mental, Social/Emotional and Physical Well-Being
- Self-Confidence in Ability to Succeed
- Sense of Belonging in the School Environment
- Positive Attitude Toward Work and Learning

Behavior Standards: Learning Strategies

- Demonstrate Critical-Thinking Skills to Make Informed Decisions
- Demonstrate Creativity
- Use Time-Management, Organizational and Study-Skills
- Apply Self-Motivation and Self-Direction to Learning
- Apply Media and Technology Skills
- Gather Evidence and Consider Multiple Perspectives to Make Informed Decisions

Behavior Standards: Self-Management Skills

- Demonstrate Ability to Assume Responsibility
- Demonstrate Ability to Work Independently
- Demonstrate Ability to Overcome Barriers to Learning
- Demonstrate Effective Coping Skills when Faced with a Problem
- Demonstrate Personal Safety Skills

Behavior Standards: Social Skills

- Use Effective Oral and Written Communication Skills and Listening Skills
- Create Positive and Supportive Relationships with Other Students
- Use Effective Collaboration and Cooperation Skills
- Use Leadership and Teamwork Skills to Work Effectively in Diverse Teams
- Demonstrate Social Maturity and Behaviors Appropriate to the Situation and Environment